Total Cost of Care Lower among Medicare Fee-for-Service Beneficiaries Receiving Care from Patient-Centered Medical Homes

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This is the peer reviewed version of the following article:

Van Hasselt, M., McCall, N., Keyes, V., Wensky, S. G., & Smith, K. W. (2015). Total Cost of Care Lower among Medicare Fee-for-Service Beneficiaries Receiving Care from Patient-Centered Medical Homes. Health Services Research, 50(1), 253–272. DOI: 10.1111/1475-6773.12217.

which has been published in final form at https://doi.org/10.1111/1475-6773.12217. This article may be used for non-commercial purposes in accordance with Wiley Terms and Conditions for Use of Self-Archived Versions.

Abstract:

Objective. To compare health care utilization and payments between NCQA-recognized patient-centered medical home (PCMH) practices and practices without such recognition.

Data Sources. Medicare Part A and B claims files from July 1, 2007 to June 30, 2010, 2009 Census, 2007 Health Resources and Services Administration and CMS Utilization file, Medicare's Enrollment Data Base, and the 2005 American Medical Association Physician Workforce file.

Study Design. This study used a longitudinal, nonexperimental design. Three annual observations (July 1, 2008–June 30, 2010) were available for each practice. We compared selected outcomes between practices with and those without NCQA PCMH recognition.

Data Collection Methods. Individual Medicare fee-for-service (FFS) beneficiaries and their claims and utilization data were assigned to PCMH or comparison practices based on where they received the plurality of evaluation and management services between July 1, 2007 and June 30, 2008.

Principal Findings. Relative to the comparison group, total Medicare payments, acute care payments, and the number of emergency room visits declined after practices received NCQA PCMH recognition. The decline was larger for practices with sicker than average patients, primary care practices, and solo practices.

Conclusions. This study provides additional evidence about the potential of the PCMH model for reducing health care utilization and the cost of care.

Keywords: Patient-centered medical home | Medicare payments | health care utilization

Article:

In 2007, four medical specialty societies published a joint statement on the principles they believed should form the basis of the patient-centered medical home (PCMH) model (American Academy of Family Physicians 2007; Barr 2008). These principles emphasize personal relationships, team delivery of care for the whole person, coordination across specialties and care settings, quality and safety improvement, and open access (Burton, Devers, and Berenson 2012). From the joint principles, a multitude of PCMH projects, pilots, and demonstrations have grown (Patient-Centered Primary Care Collaborative [PCPCC] 2009, 2013, 2014).

In 2008, the National Committee for Quality Assurance (NCQA) used these principles to develop a program for formally recognizing medical practices as PCMHs. Its 2008 version of the PCMH assessment tool, the Physician Practice Connections–Patient-Centered Medical Home (PPC-PCMH), consists of 30 elements categorized under nine major standards: access and communication, patient tracking and registry functions, care management, patient self-management support, electronic prescribing, test tracking, referral tracking, performance reporting and improvement, and advanced electronic communication. Practices seeking recognition must complete the PPC-PCM Hassessment tool and submit documentation supporting their responses. Practices receive scores based on their responses to each element and review of documentation by NCQA surveyors. The sum of points for all elements yields a PPC-PCMH total score ranging from 0 to 100. To earn recognition, the total score must be 25 points or more and minimum scores must be achieved for at least 5 of 10 designated "must pass" elements. Three levels of NCQA recognition are awarded, with Level 3 practices receiving the highest scores (Scholle, Saunders, and Tirodkar 2011).

Although the number of PCMHs has been increasing over time, generalized evidence of effectiveness of the PCMH model remains limited (Peikes et al. 2012). Three reviews of evaluations of PCMH interventions both found mixed evidence of impacts for most outcomes studied. In a review of 21 evaluations published from 2007 to 2010, the only consistent findings were for quality of care; all seven studies that included some aspect of quality as an outcome showed that PCMHs were associated with significant improvement in quality of care (Hoff, Weller, and Depuccio 2012). For other outcomes—emergency department utilization, inpatient utilization, expenditures, and beneficiary experience with care—studies tended to find impacts in the hypothesized direction or no significant effect. Another systematic review identified only six studies that were considered to have rigorous quantitative findings on at least one of the triple aim outcomes of improving health, improving health care, and lowering costs (Peikes and Chen 2009). These studies showed mixed evidence of impacts: three of five studies found favor-able impacts on hospital use; one of three found favorable impacts on emergency department use; two of three found favorable impacts on patient experience with care; and one of three found favorable impacts on process of care. There is some evidence that the strongest favorable impacts are concentrated in the highest risk subgroups. A third systematic review identified 19 comparative studies demonstrating small to moderate positive effects on patient and staff experiences and delivery of preventive services, reductions in emergency department visits, but no cost savings or reductions in hospital admissions in older adults (Jackson et al. 2013).

This study examines whether patterns of health care use and expenditures for Medicare fee-for-service (FFS) beneficiaries differ between a sample of NCQA-recognized PCMHs and a set of practices without such recognition. We used a standard definition of a PCMH, with auditing by NCQA, which has been lacking in many of the published studies to date.

Methods

Study Design

A longitudinal, quasi-experimental study design was used to examine practice-level patterns and costliness of care for Medicare FFS beneficiaries, who received medical treatment between July 1, 2007 and June 30, 2010 from one of 308 NCQA-recognized PCMHs versus a comparison group of beneficia-ries who received care from a set of medical practices lacking NCQA PCMH recognition. July 1, 2007–June 30, 2008 served as the baseline period, which was prior to or concurrent with the launch of the NCQA PPC-PCMH program.

Study Sample

Our PCMH sample was initially drawn from 1,247 practice locations that received recognition as a PCMH by NCQA's 2008 PPC-PCMH program between 2008 and 2010. Of these practice locations, 1,065 practices treated Medicare FFS beneficiaries and were deemed initially eligible for participation in our study. Once eligible, we contacted each practice location and invited the practice to participate in the study with a request to sign a data release authorization form. To enhance response, we provided web-based, fax, regular mail, and e-mail reporting options. Follow-up contacts were made by telephone and e-mail to encourage study participation, update lists of providers affiliated with the practice, and check the eligibility status of each practice. Of the 1,065 practice locations contacted, 340 (32 percent) consented to participate. Another 28 PCMHs were subsequently excluded because they had fewer than 30 beneficiaries assigned to them, and four were excluded because they had already received NCQA recognition by June 30, 2008.1This left 308 practices in the final PCMH sample. At our request, NCQA con-ducted a limited analysis of selection bias that showed our consenting PCMH sample had PPC-PCMH scores that were on average only 1.6 points higher(on a 100-point scale) than for PCMHs that did not consent to having their NCQA data released. This difference was not statistically significant. How-ever, the practices in our PCMH sample were more likely to attain Level 3recognition (73 percent vs. 67 percent) and were more likely to be from the Midwest or West and multisite practices compared to the nonconsentingPCMHs.[2] Finally, 82 percent of practices in the PCMH sample had a Level 3score based on an earlier PPC assessment tool, suggesting that these practices had started the transformation toward becoming a medical home well before obtaining formal NCQA recognition in 2009 or 2010.[3]

To select our comparison group, we first identified all physician practices, including federally qualified health centers (FQHCs), that were located in the same ZIP code areas as the consenting PCMHs but did not have NCQAPCMH recognition (n=2,382). We used Tax Identification Numbers to identify physician practices and an organizational National Provider Identification (NPI) number to identify FQHCs. We created a list of NPIs associated with each practice from Medicare physician and outpatient claims that were billed by the practice. We identified primary care providers by the following specialties: general practice, family practice, internal medicine, geriatric medicine, nurse practitioner, multispecialty practice, certified clinical nurse specialist, and physician assistant. We subsequently removed nonprimary care providers from the list. Second, we attributed Medicare FFS beneficiaries to each practice location using the methodology described below. Practices were removed from our comparison sample if they had fewer than 30 assigned beneficiaries or if they had baseline average annual total Medicare payments that exceeded maximums observed for the NCQA-recognized practices. The final comparison group sample consisted of 1,906 practices.

Beneficiaries were assigned to NCQA-recognized PCMHs and comparison practices based on a plurality of visits algorithm, a methodology adopted from previous research on Medicare beneficiaries (Pope et al. 2006; Pope and Kautter 2007). This algorithm assigned beneficiaries to practices based on where they receive the plurality of their primary care Evaluation and Management (E&M) services during the assignment timeframe, July 1, 2007 through June 30, 2008.4In situations where a beneficiary received equal numbers of E&M services from two different practices, we assigned the beneficiary to the practice with the most recent date of service. Using this process, we assigned146,410 beneficiaries to the study PCMHs and 446,273 beneficiaries to the comparison practices.

Data

Medicare Part A and B claims files were assembled for three 12-month periods: July 1, 2007–June 30, 2008 (the baseline year of data), July 1, 2008–June30, 2009, and July 1, 2009–June 30, 2010. Claims were used to construct 16 payment and utilization outcomes described below. We also used claims to construct the Charlson comorbidity index and a claims-based measure of health status, the prospective Hierarchical Condition Category (HCC) risks core (Pope et al. 2004). The HCC score is the ratio of predicted beneficiary expenditures to average expenditures. Predicted expenditures are generated from a model that collapses ICD-9 diagnostic codes into 70 categories and weights each category according to its impact on expenditures. An HCC score of 1.0 represents a beneficiary with average total expenditures. Scores less than 1.0 represent predicted expenditures less than the average, whereas scores greater than 1.0 indicate predicted expenditures greater than the average.

We constructed several practice-level variables from Medicare claims: practice type (solo, multispecialty, FQHC), the number of beneficiaries assigned to each practice, and the number of primary care providers billing Medicare. From the last variable, we created the categorical variable "practice size," defined as solo, two-person, small (3–5 providers), medium (6–10 providers), or large (more than 10 providers). From claims, it could also be deter-mined whether a beneficiary was institutionalized or not. Beneficiaries were considered institutionalized if they had a physician claim for a nursing home visit for any 2 months of a consecutive 3-month period. This information was used to calculate for each practice the percentage of assigned beneficiaries that were institutionalized.

Medicare's Enrollment Database (EDB) provided beneficiary characteristics, including age, sex, race, Medicaid enrollment, original reason for Medi-care eligibility (disability or old age), and the presence of end-stage renal disease. We categorized age as younger than 65 years old, between 65 and75 years old, between 76 and 85 years old, and 86 years or older. The EDB was used to construct a weight reflecting the fraction of each year the beneficiary was eligible for Medicare Parts A and B.

The 2007 Health Resources & Services Administration Utilization file and the 2005 American Medical Association Physician Workforce file provided data for each practice on the number of FQHCs in the surrounding area, the numbers of primary care and specialty physicians per 100,000 population, and the percentages of the population with a past-year primary care visit or emergency room visit. We used practice addresses to classify each practice as being in a metropolitan statistical area or not, and in the Midwest, Northeast, West, or South. We retrieved median household incomes for the practice ZIP code areas from the 2009 U.S. Census.

Statistical Analysis

The practice was the unit of analysis. Beneficiary claims data were aggregated to the practice level after annualizing utilization and payment outcomes for beneficiaries with less than a full year of eligibility (Ellis and Ash 1995; Diehret al. 1999). Annualized outcomes were constructed by dividing actual out-comes by the "eligibility fraction," which is the average fraction of the year (at the practice level) that beneficiaries were eligible for Medicare Parts A and B.

We used propensity score weighting in the descriptive and regression analyses. In this context, the propensity score (PS) is the probability that a practice obtained NCQA PCMH recognition between July 1, 2008 and June30, 2010, conditional on a set of characteristics (covariates). To estimate the propensity score, we used a logistic regression model. The covariates in this regression included (1) average beneficiary characteristics (HCC and Charlson scores, disability, end-stage renal disease, institutionalized, age, sex, race, Medicaid enrollment); (2) practice characteristics (practice size, practice type, practice location); and (3) area characteristics (median household income, average number of FQHCs in the surrounding area, percentages of the area population with at least one primary care or emergency room visit during the previous year, numbers of primary care and specialty physicians per 100,000population). Covariate data were taken from the baseline year, July 1, 2007–June 30, 2008.

We analyzed the following outcome variables: rates per 1,000 beneficiaries of hospital admissions and emergency room visits (including observation bed status); 30-day readmission rates per 1,000 live discharges for any condi-tion and for a set of 34 ambulatory care sensitive conditions (ACSCs) (see Appendix A for complete listing); E&M ambulatory visits and FQHC visits per 1,000 beneficiaries to primary care providers and medical and surgical specialists; and average annual Medicare payments, in total, and for six major types of service (acute care hospital, outpatient department, home health, hospice, FQHC, and physician services). Medicare payments include all Part A and B services, including payment to hospitals for indirect medical education and disproportionate share of Medicaid patients but exclude Part D (pharmacy), third-party payments, and beneficiary deductibles and coinsurance.

For the beneficiary-, practice-, and area-level covariates, we calculated baseline means for the NCQA-recognized PCMHs and both unweighted and weighted baseline means for the sample of comparison practices. The weighted means were calculated using the factor PS/(1-PS) as the weight. In theory, weighting by the propensity odds makes practices in the comparison group more similar or comparable to NCQA-recognized practices, in terms of their covariate distributions. We assessed covariate balance after weighting by calculating the standardized differences between the two groups (D'Agostino1998; Austin 2009) ensuring balance for important covariates. For the payment and health care utilization variables, we only calculated the sample means for the NCQA-recognized PCMHs and comparison practices. Because these variables are the outcomes of interest, they cannot be used to estimate the propensity score. Hence, for these variables weighted means and standardized differences are meaningless.

We used a difference-in-differences linear regression model to estimate the impact that NCQA-recognized PCMHs had on outcomes. This outcome model contained, in addition to the baseline beneficiary- and practice-level variables discussed above, indicators for the NCQA-recognized PCMH group, for the two outcomes periods, July 1, 2008–June 30, 2009 and July 1,2009–June 30, 2010, and for receipt of NCQA PCMH recognition. The value for the PCMH group indicator is always 0 for comparison practices and always 1 for the PCMHs. The coefficient of this variable measures the baseline difference between the PCMH and comparison

groups. The 2-year indicators represent the periods July 1, 2008–June 30, 2010 and their coefficients measure the changes over time (relative to the baseline period) for comparison group practices. The indicator for receipt of NCQA recognition is either 0(not recognized) or 1 (recognized). It "switches on" from 0 to 1 during the period that a practice was first recognized as a PCMH. Hence, for practices that gained NCQA recognition in the periods July 1, 2008–June 30, 2009 or July 1, 2009–June 30, 2010, the three annual values are (0,1,1) and (0,0,1), respectively. The coefficient of the NCQA recognition indicator is the main parameter of interest: it measures the extent to which the change in outcomes over time differed from the prerecognition baseline period for NCQA-recognized PCMHs relative to comparison group practices.

We estimated the PCMH effect using weighted least squares. The regression weights were calculated in two steps. First, we estimated a logistic regression model for the propensity score (described above) and set the initial weights equal to 1 for PCMHs and equal to the propensity odds PS/(1-PS) for comparison practices (Hirano and Imbens 2001). These initial weights were then multiplied by practice size (to account for heteroskedasticity resulting from varying practice sizes) and the average Medicare eligibility fraction for Medicare FFS beneficiaries assigned to the practice, to yield the final regression weights. We used a bootstrap procedure to calculate the standard errors (Cameron and Trivedi 2005). The bootstrap samples were generated by randomly drawing (with replacement) practices and including for each the three annual observations to account for the clustering at the practice level. Finally, we estimated PCMH effects for selected subgroups of practices, with groups defined by practice type, practice size, and average HCC scores. We considered three categories of average HCC score: less than 0.925 reflects a healthier than average panel; the range 0.925–1.07 reflects an average panel; and greater than 1.07 reflects a sicker than average panel.

Results

Baseline characteristics

Table 1 contains unweighted and weighted sample means of the beneficiary-, practice-, and area-level characteristics during the baseline period (July 1,2007–June 30, 2008). The group of NCQA-recognized PCMHs had a lower proportion of solo practices (22 percent vs. 60 percent) and on average more assigned Medicare FFS beneficiaries (410 vs. 210). NCQA-recognized PCMHs were more likely to be an FQHC (11 percent vs. 1 percent), and less likely to be in a Metropolitan Statistical Area (88 percent vs. 94 percent) or the South (25 percent vs. 31 percent). Medicare FFS beneficiaries assigned to NCQA-recognized PCMHs were on average in slightly better health, as measured by a lower baseline HCC score (0.9 vs. 1.04) and a lower Charlson score (0.59 vs. 0.74). NCQA-recognized PCMHs also tended to be located in areas with lower rates of primary care and specialty physician visits. The last column in Table 1 shows standardized differences. For all beneficiary-, practice-, and area-level covariates, the standardized differences are less than 10 (a threshold that is often used in practice), indicating good covariate balance after weighting.

Table 1: Baseline Characteristics of NCQA-Recognized Patient-Centered Medical Homes (PCMHs) and Practices without NCQA Recognition; July 1,2007–June 30, 2008

	NCQA-Recognized PCMHs	*Comparison Practices*		*Standardized Difference*
		Unweighted	*Weighted*	
Number of practices	308	1,906		
Practice characteristics				
National provider identifiers (NPIs) in practice	4.6 (4.7)	4.6 (10.3)	4.5 (6.5)	1.3
Solo practices (%)	22 (42)	60 (49)	22 (55)	0.1
Federally qualified health centers (FQHCs; %)	11 (31)	1 (11)	12 (43)	3.2
Multispecialty (%)	28 (45)	20 (40)	25 (57)	6.7
Assigned beneficiaries	410 (430)	210 (278)	398 (554)	2.4
Metropolitan statistical area (%)	88 (33)	94 (24)	88 (44)	0.4
Midwest (%)	8 (27)	7 (25)	8 (36)	0.4
Northeast (%)	59 (49)	53 (50)	58 (66)	2.7
West (%)	8 (26)	9 (29)	7 (35)	0.3
South (%)	25 (43)	31 (46)	27 (59)	3.4
Beneficiary characteristics				
Hierarchical condition category (HCC) risk score	0.9 (0.15)	1.04 (0.25)	0.9 (0.22)	2.2
Charlson score	0.59 (0.28)	0.74 (0.35)	0.6 (0.36)	3.5
Disabled (%)	25 (17)	22 (17)	26 (29)	5.3
End-stage renal disease (%)	0.4 (0.6)	1 (1.7)	0.4 (0.8)	2.1
Institutionalized (%)	0.3 (1.7)	1 (5.2)	0.3 (2.3)	0.2
Age				
<65 (%)	18 (15)	16 (17)	20 (28)	6.2
65–75 (%)	45 (10)	43 (13)	44 (18)	5.4
76–85 (%)	27 (9)	30 (10)	27 (14)	4.1
>85 (%)	10 (6)	11 (9)	9 (10)	1.6
Female (%)	60 (8)	60 (11)	60 (13)	2.8
Non-white (%)	15 (20)	18 (23)	16 (30)	5.4
Medicaid (%)	18 (17)	18 (20)	19 (29)	6.1
Area characteristics				
Median household income (in $1,000s)	48.3 (18.7)	48.3 (16.5)	46.9 (21.2)	6.9
Average number of FQHCs in surrounding area	0.4 (0.8)	0.4 (0.9)	0.4 (1.0)	0.0
Rate of primary care physicians (per 100,000 population)	143 (187)	207 (216)	146 (228)	1.7
Rate of specialty physicians (per 100,000 population)	316 (779)	567 (928)	335 (937)	2.2
Percent of population with at least one emergency room visit in previous year	27 (5)	26 (5)	27 (6)	0.9
Percent of population with at least one primary care visit in previous year	77 (10)	74 (10)	77 (12)	0.2
Hospitalizations*				
For any condition	189 (75)	258 (138)		
For ACSCs†	64 (41)	91 (73)		
Emergency room visits*				
For any condition	405 (173)	513 (327)		
For ACSCs†	119 (62)	153 (106)		
30-day readmissions‡				
For any condition	23 (20)	37 (40)		
For ACSCs†	6 (8)	10 (17)		
Visits by physician specialty*				
Primary care (1,000s)	3.58 (1.15)	3.77 (1.50)		
Medical specialist (1,000s)	2.48 (1.13)	3.20 (1.59)		
Surgical specialist	438 (178)	541 (350)		
Medicare payments by type of service§				
Total	5,382 (1,901)	7,169 (3,012)		
Acute care hospital	1,829 (959)	2,477 (1,446)		
Outpatient	805 (376)	987 (584)		
Home health	247 (216)	364 (382)		
Hospice	28 (84)	43 (158)		
FQHC	34 (96)	13 (44)		
Physician	1,671 (605)	2,256 (908)		

Note. Standard deviations in parentheses.

*Rate per 1,000 Medicare FFS beneficiaries.
†Ambulatory care sensitive conditions.
‡Rate per 1,000 live hospital discharges.
§Amount in dollars ($).

Baseline health care utilization was lower among NCQA-recognized PCMHs, across all utilization measures used in this study. For example, the number of hospitalizations (per 1,000 beneficiaries) for any condition was 27percent lower than in the comparison group (189 vs. 258), whereas emergency room visits (per 1,000 beneficiaries) for any condition were 21 percent lower (405 vs. 513). Average Medicare payments per Medicare FFS beneficiary, except for FQHC payments, were also lower for NCQA-recognized PCMHs. For example, average total Medicare payments were 25 percent lower than for the comparison group ($5,382 vs. $7,169).

Utilization of Care

Relative to the comparison group, emergency room visits declined for practices who received NCQA PCMH recognition (Table 2). The difference-in-differences estimates indicate that relative to the comparison group, the rate of emergency room visits for any condition declined on average by 55 (p<.001)per 1,000 beneficiaries, and the rate of emergency room visits for ACSCs declined on average by 13 (p<.001) after a practice received NCQA recognition as a PCMH. Other utilization outcomes, including hospitalizations, 30-day readmissions, and annual visits, were not affected by receipt of NCQA PCMH recognition. The difference-in-differences estimates for these outcomes were not statistically significant.

Table 2: Estimated Difference-in-Differences Parameters for Medicare Payments and Health Care Utilization

Dependent Variable	*Estimate*	*Standard Error*
Hospitalizations†		
For any condition	−1.4	(5.2)
For ACSCs‡	−1.1	(2.7)
Emergency room visits†		
For any condition	−54.8***	(8.6)
For ACSCs‡	−13.4***	(3.5)
30-day readmissions§		
For any condition	−1.8	(1.43)
For ACSCs‡	−0.7	(0.53)
Visits by physician specialty†		
Primary care	11.3	(79.05)
Medical specialist	14.1	(65.82)
Surgical specialist	−17.8	(9.58)
Medicare payments by type of service¶		
Total Medicare payments	−265*	(109)
Acute care hospital payments	−164*	(66)
Outpatient department payments	−25	(22)
Home health payments	−11	(13)
Hospice payments	13	(10)
Federally qualified health center payments	3	(5)
Physician payments	−26	(28)

†Rate per 1,000 Medicare FFS beneficiaries.

‡Ambulatory care sensitive conditions.
§Rate per 1,000 live hospital discharges.
¶Amount in dollars ($).
*p<.05;**p<.01;***p<.001.

Cost of Care

Total annual Medicare payments for practices that received NCQA PCMH recognition declined by $265 (p<.05) relative to comparison group practices. This shows that for PCMH practices, receipt of NCQA recognition was associated with a 4.9 percent (=265/5,382) reduction in the trend in total payments. The majority of this decline, 62 percent ($164 ,p<.05), can be attributed to a relative decline in payments to acute care hospitals. The remaining Medicare payment outcomes, for more specific types of services, appeared unaffected by NCQA PCMH recognition.

Outcomes by Selected Practice Characteristics

We examined selected outcomes by three levels of average HCC risk score, practice type, and practice size (Table 3). Our regression estimates show that among practices with either healthier or sicker than average Medicare FFS beneficiaries, receipt of NCQA PCMH recognition was associated with a reduction in total Medicare payments, relative to the comparison group (Table 3). The (absolute) magnitude of the reduction was larger for NCQA-recognized PCMHs with sicker than average Medicare FFS patients (-$1,321, p<.05) than for NCQA-recognized practices with healthier than average Medicare FFS patients (-$237,p<.05). For practices with sicker than average Medicare FFS patients, the larger reduction in total Medicare payments may be partly due to a significant reduction, relative to the comparison group, in the rate of hospitalizations for any condition (39 per 1,000 beneficiaries, p<.05). The rate of emergency room visits declined for NCQA-recognized PCMHs relative to the comparison group across all three HCC risk score groups, with reductions ranging from 38 to 97 visits per 1,000 beneficiaries. Among practices in the low HCC risk score group, the rate of emergency room visits per 1,000 beneficiaries for ACSCs declined for NCQA-recognized PCMHs (-14,p<.01) relative to comparison practices, whereas in the medium HCC risk score group, the rate of visits (per 1,000 beneficiaries) to a medical specialist declined (-169,p<.05) for NCQA-recognized PCMHs relative to comparison practices.

Among primary care practices, receipt of NCQA PCMH recognition was associated with a reduction in total Medicare payments (-$325,p<.01)relative to comparison practices, as well as declines in the rate of visits to surgical specialists (-27 per 1,000 beneficiaries, p<.05) and in the rates of emergency room visits for any condition (-68 per 1,000 beneficiaries, p<.001)and for ACSCs (-18 per 1,000 beneficiaries, p<.001). The impact of NCQAPCMH recognition was more limited for multispecialty practices and FQHCs. Among multispecialty practices, NCQA PCMH recognition was only associated with a decline in the rate of emergency room visits for any condition (-35 per 1,000 beneficiaries, p<.05), relative to multispecialty practices in the comparison group. For FQHCs, none of the estimated effects were statistically significant.

Table 3: Estimated Difference-in-Differences Parameters for Total MedicarePayments and Health Care Utilization, by Practice Type

	Total Medicare Payments	Hospitalizations†		Emergency Room Visits†		Physician Visits†		
		For Any Condition	For ACSCs‡	For Any Condition	For ACSCs‡	Primary Care	Medical Specialist	Surgical Specialist
HCC risk score								
<0.925	−237*	−4	−2	−53***	−14**	−26	−53	−22
0.925–1.07	−78	9	5	−38**	−6	73	−169*	−26
>1.07	−1,321*	−39*	−17	−97**	−230	130	101	−26
Practice type								
Primary care	−325**	−4	−4	−68***	−18***	−12	34	−27*
Multispecialty	−273	2	4	−35*	−3	−108	−56	−12
FQHC	−127	2	−3	−59	−22	323	−142	−11
Practice size								
Solo	−451*	−10	−10*	−57***	−18**	293	−18	−14
2-Person	−280	10	12	−63***	−10	149	−346***	−10
Small (3–5)	−316	4	−2	−41**	−10*	−1	−25	−9
Medium (6–10)	−264	−1	−1	−30*	−11	−15	16	−37*
Large (>10)	−215	−4	3	−71**	−8	71	−9	−42

†Rate per 1,000 Medicare FFS beneficiaries.
‡Ambulatory care sensitive conditions.
*p<.05;**p<.01;***p<.001.

We also examined selected outcomes by practice size. Total Medicare payments among NCQA-recognized solo practices declined relative to comparison solo practices (-$451, p<.05), but no effects on total payments were seen for the larger-sized practices. The rate of hospitalization for ACSCs declined among NCQA-recognized solo practices (-10 per 1,000 beneficiaries, p<.05) relative to solo practices in the comparison group. Among all five practice size categories, the rate of emergency room visits for any condition declined for NCQA-recognized PCMHs relative to their comparison practices, with differences in reductions ranging from 30 to 71 visits per 1,000 beneficiaries. The rate of emergency room visits for ACSCs declined for NCQA-recognized solo practices (-10 per 1,000 beneficiaries, p<.05) and for 3–5 person practices, compared to similar sized comparison practices. The rate of visits to a medical specialist declined for 2-personNCQA-recognized PCMHs relative to comparison practices (-346 per 1,000 beneficiaries, p<.001), and the rate of visits to surgical specialists declined for6–10 person NCQA-recognized PCMHs relative to comparison practices(-37 per 1,000 beneficiaries, p<.05). For primary care visits, none of the estimated effects were statistically significant.

Discussion

The Institute for Healthcare Improvement developed a framework for optimizing health system performance that calls for primary care services and structures to be redesigned (Berwick, Nolan, and Whittington 2008). The PCMH model is thought by many to be a way to accomplish the framework's goals of improved patient experience and population health and reductions in cost of care. While two recent reviews of the literature concluded that the evidence for cost reductions is mixed (Hoff, Weller, and Depuccio 2012; Peikes et al. 2012), in this study we found that total Medicare payments and payments to acute care hospitals for Medicare FFS beneficiaries served

by NCQA-recognized PCMHs declined relative to those served by practices lacking NCQA PCMH recognition.

This study also found that the impact of obtaining NCQA PCMH recognition on Medicare payments was greatest among PCMHs with sicker than average panels of Medicare FFS beneficiaries, among primary care practices, and among solo practices. Our finding for the sicker, higher risk patients agrees with results from several earlier studies (Counsell et al. 2009; Flottemesch et al. 2012), and it affirms the belief that the PCMH model can be particularly useful for patients with chronic conditions who typically receive care from many providers and may receive redundant care that compromises quality and increases spending.

Perhaps contrary to expectations, the set of PCMHs included in this study did not lower hospital admission rates relative to practices lacking PCMH recognition. Findings in the literature with regard to hospital use have also been mixed (Hoff, Weller, and Depuccio 2012; Peikes et al. 2012). How-ever, more than half of the reduction in total Medicare payments was attributable to lower payments to acute care hospitals. Although both sets of practices have similar distributions of admissions across the Medicare Severity Diagnosis Related Group code levels of severity, average total payments as well as average indirect medical education and disproportionate share payments arelower for patients being treated at PCMHs. This suggests that there may be a difference in the types of hospitals to which PCMHs admit their patients, a finding observed in a study of the Massachusetts Blue Cross Blue Shield's Alternative Quality Contract (Song et al. 2011), or fewer beneficiaries reaching a payment outlier status. Further examination of this issue is warranted.

Another main finding of this study is that the rate of emergency room visits, for any condition and for ACSCs, declined among Medicare FFS beneficiaries served by practices who became NCQA-recognized PCMHs, relative to beneficiaries receiving care from practices in the comparison group. This result agrees with findings reported elsewhere in the literature (e.g., Counsell et al. 2007), though the overall evidence for the impact of PCMHs on emergency room visits is still somewhat mixed (Hoff, Weller, and Depuccio 2012; Peikes et al. 2012). Our finding suggests that the practices recognized as PCMHs were able to prevent some emergency room visits, perhaps through more efficient care coordination and care management.

A major strength of this study is the use of a large, longitudinal sample of medical practices, which allowed us to observe outcome trends over time and the ways in which NCQA PCMH recognition altered those trends. There are, however, several limitations which may have affected our results and may limit generalizability. First, this study was limited to Medicare FFS beneficiaries and the practices that serve them. Similar results may not be observed in other patient populations or in practices that do not serve Medicare FFS beneficiaries. Second, this study focused on NCQA recognition, but other national programs for medical home recognition or accreditation exist, including the Accreditation Association for Ambulatory Health Care, the Joint Commission, and URAC (PCPCC 2014). Each program places a different emphasis on specific elements of the medical home model (Burton, Devers, and Berenson 2012). Because the evidence identifying elements that can be most successful in reducing costs or lowering unnecessary utilization is still developing, the findings reported here do not necessarily generalize to practices that received PCMH recognition through a different program. Third, only 32 percent of NCQA-recognized PPC-PCMHs agreed to participate in our study. We found this group of practices to have lower average total Medicare payments during the baseline year than the pool of comparison practices. We also had disproportionately more Level 3 practices than the initial population of PCMHs with recognition, and these practices scored high on an earlier PPC

assessment tool. This suggests that practice transformation in our sample of PCMHs started prior to our baseline year, and that these practices were relatively advanced, early adopters of PCMH principles. While the use of propensity score weighting better aligned the comparison group with the set of NCQAPCMHs and aimed to minimize selection bias, the results still need to be interpreted with care. The effects reported here do not capture the full impact of the practice transformation process, a process that likely started before our sample period. Also, our results are based on practices that were early adopters of PCMH principles; they may not generalize to late adopters. Fourth, the comparison group broadly represented primary care practices in the same geographic areas as the PCMHs. Propensity score weighting was used to create more covariate balance between the two groups. We cannot rule out the possibility of some residual estimation bias resulting from an imbalance in unobserved confounding factors that affect payments. However, this bias is less likely to cause problems than, for example, in a cross-sectional design, because our difference-in-difference estimates are based on the differences in changes over time, and therefore are not affected by observable and unobservable between-group differences at baseline.

This study contributes to the growing evidence base that PCMHs may reduce the cost of care by providing results that the set of studied PCMHs was able to lower costs and decrease use of some services for Medicare FFS beneficiaries compared to medical practices that had not yet received NCQA PPC-PCMH recognition. However, given the observational nature of our study design and the associated limitations noted above, the evidence we provide is by no means definitive. Further evaluation of the ability of PCMHs to lower the cost of care is warranted through more rigorous study designs that include a broader array of PCMHs and patient populations and allow for a better understanding of the degree of practice transformation prior to the start of the measurement period.

A question left unanswered is whether, from a broader health system perspective, the PCMH model is associated with net cost savings. Net savings are determined by both changes in medical expenditures on the patient side and operating costs—including the costs of obtaining and maintaining medical home recognition—on the practice side. We are aware of only two studies to date that have examined the association between the degree of "medical homeness" and practice operating costs (Zuckerman et al. 2009; Nocon et al. 2012). While these studies provide some evidence of a positive association—more advanced PCMH practices tend to have higher operating costs—this relation may not be a causal effect. For our study, we did not have access to reliable data on the incremental costs of obtaining and maintaining NCQA PPC-PCMH recognition, so that it remains unclear whether the estimated reductions in Medicare expenditures were sufficient to offset these costs. A comprehensive cost–benefit analysis therefore remains an important topic for future study.

Acknowledgements

Joint Acknowledgment/Disclosure Statement: This research was supported by funding from the Centers for Medicare & Medicaid Services (CMS). Preliminary findings of this research were presented at a Federal PCMH Collaborative webinar on October 18, 2011 and at the Academy Health conference on June24, 2012. The authors thank Ann Larsen at RTI International for her assistance with programming and data management and two anonymous referees for comments on an earlier version of the manuscript.

Disclosures: None.

Disclaimers: The statements contained herein are those of the authors and do not necessarily reflect the views or policies of CMS.

Notes

1. Our study had a before/after design. Practices that already had NCQA PPC-PCMH recognition by June 30, 2008 had no preintervention baseline and were therefore excluded.
2. NCQA provides three levels of recognition, with higher levels indicating that the practice had higher scores on the PPC-PCMH instrument.
3. We were unable to obtain data on early PPC recognition for practices that did not consent to have their NCQA data released. If the level of earlier PPC recognition is a good predictor of the level of NCQA recognition attained in 2009 or 2010, however, it is likely that on average the consenting practices had higher levels of early PPC recognition than the nonconsenting ones. In other words, in 2008, the practices in our PCMH study sample were likely in a more advanced stage of the transformation process toward becoming a medical home.
4. We defined primary care E&M visits as CPT codes 99201–99205; 99211–99215;99241–99245; 99304–99350; 99381–99387; 99391–99397; 99401–99412;99420–99429; G0402; G0438; G0439; and revenue center codes 051 and 052 for FQHC's global visit codes.

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